Original Article

The Prevalence of Malocclusion among 10–12-Year-Old Schoolchildren in Khammam District, Telangana: An Epidemiological Study

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Abstract

Aim: The study aimed to determine the prevalence of malocclusion among 10–12-year-old school-going children in Khammam district of Telangana state. **Materials and Methods:** A descriptive cross-sectional study was conducted among 2550 schoolchildren aged 10–12 years old in the Department of Pedodontics and Preventive Dentistry, Mamata Dental College and Hospital, Khammam, Telangana, India, to assess the prevalence of malocclusion. An oral examination was conducted by a single trained examiner using a mouth mirror and probe. Occlusal characteristics such as molar relation, overjet, overbite, open bite, crossbite, midline deviations, midline diastema, and rotation were recorded. The data were tabulated and analyzed using the Chi-square test. **Results:** The results revealed that the overall prevalence of malocclusion was 76.6%. Of this, 65.9% of the children had Angle's Class I malocclusion, 9.25% had Class II malocclusion, and 1.37% had Class III malocclusion. About 15.4% showed an increased overjet (>3 mm), 0.2% had reverse overjet, 43.6% had increased overbite (>3 mm), 2% had open bite, 14.01% had crossbite, 46.23% had deviation of midline, 2.07% had midline diastema, and 2.98% had rotated tooth. **Conclusion:** There is a high prevalence of malocclusion among schoolchildren in Khammam district of Telangana. Problems of a functional nature that arise from these morphological changes may become more complex skeletal problems in future with serious psychosocial consequences for the developing individual.

Keywords: Malocclusion, molar relationship, prevalence

Introduction

Balanced facial features are much more pleasing and appealing in the majority of races and sexes rather than irregular or protruding teeth which also give a reflection of negative status. Malocclusion greatly affects the psychological and social well-being of the children. Well-aligned teeth and a pleasing smile reflect positive status and well-being.[1] Studies on the prevalence of malocclusion in public health provide important epidemiological data to assess the type and distribution of occlusal characteristics of a given population, its treatment need and priority, and the resources required to offer treatment in terms of work capacity, skills, ability, and materials to be employed.[2]

The World Health Organization (WHO) criteria for oral health assessment were used to examine the oral status of children, and the age group between 10 and 12 years was selected to know the incidence and intercept developing malocclusions.[1] In India, the prevalence of malocclusion varies from 20% to 43%.[3] Many cross-sectional studies have been attempted previously to examine the malocclusion in different populations representing the Indian population.[1] However, no studies have been reported in Khammam, Telangana state of India. Hence, the aim and objective of the present study were to determine the prevalence of malocclusion and associated variables such as overjet, overbite, open bite, crossbite, midline deviations, midline diastema, and rotation of teeth

Received: 14-Mar-2019 **Accepted:** 12-Oct-2019 **Published:** 29-Nov-2019

Access this article online

Quick Response Code:

Website: www.ijpedor.org

DOI: 10.4103/ijpr.ijpr_5_19

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How to cite this article: Reddy NV, Reddy MA, Chandana N, Karthik T, Daneswari V, Niharika P. The prevalence of malocclusion among 10–12-year-old schoolchildren in Khammam district, Telangana: An epidemiological study. Int J Pedod Rehabil 2019;4:65-70.

among 10–12-year-old school-going children in Khammam district of Telangana state.

Materials and Methods

The present descriptive cross-sectional study was conducted in the Department of Pedodontics and Preventive Dentistry, Mamata Dental College and Hospital, Khammam, Telangana, India, to assess the prevalence of malocclusion among 10–12-year-old schoolchildren for 11 months from June 2017 to April 2018. Permission from the district educational officer was obtained to get the necessary information, such as names of all schools in Khammam district, their addresses, and total number of students studying in each division in each school for the construction of a sample frame. Considering an average of 500 students from each school, six schools were randomly selected using the cluster sampling method. To make up the estimated sample size, a total of 2750 students were examined, among which 2550 children satisfied the inclusion criteria.

Ethical clearance was obtained from the Ethical Committee of Mamata Dental College. Permission from the school authorities and consent from the parents of children examined were obtained before the commencement of the study. The study was conducted as per the World Medical Association Helsinki Declaration.[4]

The inclusion criteria include children who were present on the day of examination with the informed consent of their parents, children who had all the permanent first molars erupted, and children with no neurological or systemic diseases. The exclusion criteria include a previous history of orthodontic treatment, missing permanent molars, craniofacial anomalies, associated syndromes, parents and children who did not provide consent for clinical examination, and medically compromised child.

Oral examination was conducted by a single trained examiner using a mouth mirror and probe to avoid inter-examiner bias. The children were examined while seated on a chair with good natural light illumination during class hours in a predetermined order. Each child was examined using the WHO type III criteria for oral health assessment, and for every child, a registered chart related to malocclusion was designed which includes all variables where all the findings were recorded. All occlusal relationships were evaluated at a centric occlusion position which was achieved by asking the child to swallow and then to bite in his or her most posterior teeth. Class of malocclusion in Angle's system of classification and presence of variables such as overjet, overbite, open bite, crossbite, midline deviations, midline diastema, and tooth rotation were recorded. Children with Class I molar relationship, normal overjet and overbite, proper alignment, and no gross irregularities of the tooth were categorized in the normal occlusion group.

The data were tabulated and subjected to statistical analysis. The prevalence of malocclusion was represented in proportions. Differences in proportion among the group were analysed using the Chi-square test and data were analysed using IBM SPSS Statistics for Windows. Version 24.0. Armonk. NY: IBM Corp.

Results

In the present study, the prevalence of malocclusion was conducted among 2550 school-going children, aged 10–12 years old in Khammam district, Telangana, India. Of 10, 11 and 12 years groups, 54% were male and 45.9% were female, as shown in Table 1. Among the total children examined, the normal occlusion was found in 23.4% of the participants and 76.6% presented with malocclusion. Class I malocclusion was seen in 65.9%. Class II malocclusion was seen in 9.24%. Class III malocclusion was seen in 1.3% of the participants, as shown in Table 2.

Normal overjet (<3 mm) was seen in 84.2% of participants, increased overjet (>3 mm) was seen in 15% of participants, and reverse overjet was seen in 0.27% of participants, as shown in Table 3. To present the overbite, among the total children examined, normal overbite (<3 mm) was seen in 54% of the

Table 1: Descriptive statistics of the children examined

Age (years)	Male (%)	Female (%)	Total (%)
10	54.05797	45.94203	100
11	54.06452	45.93548	100
12	54.00922	45.99078	100
Total	54.039	45.96	100

Table 2: The classification of the participants based on Angle's classification

Occlusion	Male (%)	Female (%)	Total (%)
Normal occlusion	12.54902	10.86275	23.41176
Class I malocclusion	36.31373	29.64706	65.96078
Class II malocclusion			
Division 1	2.862745	2.078431	4.941176
Division 2	0.470588	0.823529	1.294118
Class II subdivision	1.333333	1.686275	3.019608
Class III malocclusion	0.509804	0.862745	1.372549

Table 3: Distribution of overjet among participants

Overjet	Male (%)	Female (%)	Total (%)
Normal (<3 mm)	44.11765	40.15686	84.27451
Increased (>3 mm)	9.686275	5.764706	15.45098
Reverse overjet	0.235294	0.039216	0.27451

Table 4: Distribution of overbite among participants

Overbite	Male (%)	Female (%)	Total (%)
Normal (<3 mm)	29.05882	25.33333	54.39216
Increased (>3 mm)	23.80392	19.80392	43.60784
Open bite	1.176471	0.823529	2

participants, increased overbite (>3 mm) was seen in 43.6%, and open bite was seen in 2% of the participants, as shown in Table 4. In open bite, skeletal open bite was 1.7% and dental open bite was 0.19%, as shown in Table 5.

Among the total children examined for the prevalence of crossbite, complete anterior crossbite was seen in 0.2%, anterior single tooth crossbite was seen in 0.23%, unilateral complete posterior crossbite was seen among 0.03%, unilateral posterior single tooth crossbite was seen among 7.6%, and anterior and unilateral posterior crossbite was seen in 5.8% of participants, as shown in Table 6. In the examination of the midline with respect to the maxillary arch, midline deviation toward the right was seen among 17.2% of participants, midline deviation toward the left was seen among 28.9% of participants, as shown in Table 7. About 2.07% of children had midline diastema, as shown in Table 8, and 2.9% had tooth rotations, as shown in Table 9.

Table 5: Distribution of open bite among participants

Type of open bite	Male (%)	Female (%)	Total (%)
Skeletal	0.666667	1.098039	1.764706
Dental	0.078431	0.117647	0.196078

Table 6: Distribution of crossbite among the participants

Type of crossbite	Male (%)	Female (%)	Total (%)
Complete (anterior + bilateral posterior)	0	0	0
Anterior complete	0.078431	0.196078	0.27451
Anterior single tooth	0.039216	0.196078	0.235294
Unilateral posterior complete	0.039216	0	0.039216
Unilateral posterior single tooth	2.941176	4.666667	7.607843
Anterior + unilateral posterior	2.352941	3.529412	5.882353

Table 7: Distribution of midline deviation among participants

Midline deviation	Male (%)	Female (%)	Total (%)
No deviation	26.90196	26.86275	53.76471
Deviated to right	8.156863	9.098039	17.2549
Deviated to left	18.98039	10	28.98039

Table 8: Distribution of midline diastema among participants

Midline diastema	Male (%)	Female (%)	Total (%)
Present	1.019608	1.058824	2.078431
Absent	53.01961	44.90196	97.92157

Table 9: Distribution of tooth rotation among participants

Tooth rotation	Male (%)	Female (%)	Total (%)
Present	1.019608	1.960784	2.980392
Absent	53.01961	44	97.01961

Discussion

The WHO (1987), had included malocclusion under the heading of handicapping dentofacial anomaly, defined as an anomaly which causes disfigurement or which impedes function and requiring treatment "if the disfigurement or functional defect was likely to be an obstacle to the patient's physical or emotional well-being."[5]

Although malocclusion is less prevalent than caries or periodontal disease, it has a great impact on psychological and social well-being of the child.[2] It has been found to cause psychological and psychosocial problems, oral dysfunction, impaired esthetics, difficulty in mastication, swallowing, speech, periodontal disease, and mostly increased susceptibility to trauma.[1]

In studies of the prevalence of malocclusion, the material should be obtained from a well-defined population, be large enough, and cover nonorthodontically treated children. Thus, the present sample satisfies these requirements well.[6] As the prevalence of malocclusion in different studies varies according to the methods of assessment, racial differences, and the chronological age of the sample, the findings should be compared with caution.[7]

As no studies were reported in Khammam, Telangana state of India, the present study was conducted among 2550 school-going children aged 10–12 years old in Khammam District of Telangana state to report the prevalence of malocclusion according to age and gender. The WHO recommends basic oral health surveys in five selected age groups (i.e., 5 years, 12 years, 15 years, 35–44 years, and 65–74 years) to estimate the magnitude of the problem and to plan interventional activities.[8] This age group was preferred since most malocclusions are manifested at this time to its full extent.

Proffit (1986) suggested that mild-and-moderate degree of malalignment might be present even in the absence of habits or environmental factors. Angle postulated that "the first upper permanent molar, more than any other tooth or anatomical point gives a precise scientific basis for defining occlusal disharmony and occlusal anomalies."[5]

The prevalence of malocclusion in the present study was in accordance with Hemapriya *et al*. from Kancheepuram.[9] When compared with the present study, a greater prevalence of malocclusion was reported by Goel *et al*. from Ludhiana which might be due to the fact that their sample collection was done by treatment priority index.[10]

When compared with the present study, Kaur *et al*. in Karnataka reported a greater prevalence of malocclusion as their study comprises both urban and rural children in 1:2 ratio of age 13–17 years. They reported that urban population had twice the Class II sagittal occlusion and increased overjet as compared to rural population which contributed to its greater prevalence.[11]

In the present study, Class I malocclusion was found to be the most predominant, which was in accordance with the studies done by Narayanan *et al*. from Kerala.[3] When compared with the present study, Ajayi from Nigeria and Mtaya *et al*. from Tanzania reported greater prevalence of Class I malocclusion as it was the most predominant sagittal molar relationship among Nigerian and Tanzanian schoolchildren which was in accordance with African and African–American surveys.[6,12] When compared with the present study, the greater prevalence of Class I malocclusion reported by Reddy *et al*. in Nalgonda was attributed to influence of predominance of Class I molar relationship in the first transitional stage in 6–10 years' age group.[13]

The lower prevalence of Class I malocclusion, when compared with the present study, was reported by Muppa *et al*. as it consists of children with special health-care needs. They reported that premature tooth loss, missing teeth or arch length, and tooth discrepancy have a higher risk of malocclusion, and finally, disease can increase the risk of malocclusion as demonstrated by the incidence of malocclusion in population with disabilities.[14]

Celikoglu *et al*. in Turkey and Vibhute *et al*. in Mumbai showed the lower prevalence of Class I malocclusion when compared with the present study as their studies were based on the examination of pretreatment records of orthodontic patients, though the most predominant molar relationship among Turkish and Indians was Class I malocclusion.[15,16]

Untreated proximal caries in primary molars or early loss of a second primary molar may lead to forward drift of the first permanent molar, promoting the change in the molar relationship. Thus, some of the children with an Angle Class II or Class III malocclusion recorded in the present investigation might indeed have a neutral skeletal relationship.[6]

The prevalence of Class II malocclusion in the present study was in accordance with Narayanan *et al*. from Kerala.[3] Reddy *et al*. and Phaphe *et al*. stated a greater prevalence of Class II malocclusion compared with the present study, though there were no geographical variations which signify racial predominance.[13,17] The greater prevalence of Class II malocclusion when compared with the present study was reported by Abu Alhaija *et al*. from Jordan stated that, "ancestral background of the various populations may have an effect on the prevalence of Class II malocclusion."[18] Lower prevalence rate of Class II molar relation when compared with the present study reported by Mtaya *et al*. again signified the most predominant Class I molar relation seen among Tanzanian schoolchildren.[6]

In the present study, the prevalence of Class III malocclusion was in accordance with Abu Alhaija *et al*. from Jordan and Phaphe *et al*. from Bagalkot, India.[17,18] The greater prevalence when compared with the present study was reported by Vibhute *et al*., in Mumbai and Celikoglu *et al*. in Turkey, as already mentioned, they took pretreatment records of orthodontic patients to record malocclusion.[15,16]

Only true Class III molar relationship was recorded in this study. Functional anterior crossbite generally shows a Class III molar relationship in the centric position, but a Class I relationship in the retruded position and should, therefore, be diagnosed with a Class I malocclusion according to Angle. Negligence of such a differential diagnostic principle may explain variations in Class III prevalence given in the literature. However, a high incidence of anterior crossbite in Class I and in Class III malocclusion has been reported in Chinese and Indian schoolchildren, in the Chinese sample combined with crowding in the upper anterior region (50%), as a result of retrognathic maxillary growth.[19]

In the present study, increased overjet was found to be 15.4%. Increased overjet, when compared with the present study found in Jordanian schoolchildren, was in concordance with that reported for the Colombians (Thilander *et al*., 2001) but much higher than that reported for the Swedish (Thilander and Myrberg, 1973), the Saudi (Al-Emran *et al*., 1990), the British (Hill, 1992), and the Kenyan schoolchildren (Ng'ang'a *et al*., 1996). Differences in the definition of increased overjet between the above studies may have contributed to the variations in the results reported for various populations.[18] Although the sample size was less when compared with the present study, Ciuffolo *et al*. from Italy showed a greater prevalence of reverse overjet because of geographical variations.[20]

Increased overbite found in the present study was similar to the findings of Narayanan *et al.* from Kerala, Celikoglu *et al.* from Turkey.[3,15] Siddegowda and Rani in Karnataka showed a higher prevalence of overbite when compared with the present study as the sample size was large, and they used Ackerman -Proffit classification for registering malocclusion.[21] Rwakatema *et al*. in Tanzania and Phaphe *et al*. in Bagalkot reported lower prevalence when compared with the present study as the sample size was small which signifies the importance of sample size and racial variations.[17,22]

The likelihood of being diagnosed with an open bite was almost two times more in children with dental caries than in children without caries. Reduced salivary flow in children with an anterior open bite and with a mouth-breathing habit may have enhanced susceptibility to dental caries (Thylstrup and Fejerskov, 1994).[6]

Researchers during the occlusal development have reported that early decay and tooth loss, rotations, forward shift of the first molars, interferences, posterior crossbite, and mandibular shifts predispose an individual to the development of the temporomandibular joint disorders and increase the sensitivity of the skeletal muscle. Williamson and Lundquist reported that interfering dental contacts have significant effects on volumetric muscle activity. A significant relationship was detected between the posterior crossbite and joint sounds, clicking, and muscle tenderness. Muscle tenderness is more common in children with crossbite than in children without crossbite.[23]

In the present study, complete anterior and posterior crossbite was not identified. Vibhute *et al*. from Maharashtra and Kumar *et al*. from Hyderabad reported the lower prevalence of crossbite when compared with the present study because of differences in sample size and geographical variations.[1,16]

As the studies regarding the prevalence of midline deviations were very less, the presence of midline deviations was evaluated. In the present study, midline deviation was seen in 46.23% of the participants. Deviation toward the right was seen in 17.25% of the participants. Deviation to the left was seen in 28.9% of the participants.

The higher prevalence of midline diastema, when compared with the present study, was shown by Ajayi from Nigeria. Ajayi indicated abnormal labial frenal attachment and dentoalveolar disproportion in Nigerian children.[12] Onyeaso indicated that diastema is not regarded as a malocclusion among Nigerians but as a mark of natural beauty.[24] Lower prevalence rate when compared with the present study reported by Narayanan *et al*. in Kerala was because of racial difference.[3]

The prevalence of tooth rotations in the present study was in accordance with Kumar *et al*. from Hyderabad and Narayanan *et al*. from Kerala.[1,3] When compared with the present study, the greater prevalence was reported by Vibhute *et al*. from Mumbai as they took pretreatment records of orthodontic patients to record malocclusion.[16] The most commonly rotated teeth found in the present study were maxillary right lateral incisor followed by mandibular right lateral incisor.

In the era of evidence-based dentistry, the findings of the present study will not only help in identifying the most prevalent variables of malocclusion but also help in taking necessary preventive as well as early interceptive measures for the correction of malocclusion, thereby preventing future complex and complicated treatment protocols in the permanent dentition.

Summary and Conclusion

- Problems of a functional nature that arise from these morphological changes may become more complex skeletal problems in future with serious psychosocial consequences for the developing individual
- Finally to conclude the recordings of the present study will not only serves to pose malocclusion as a public problem but also serves as a first step for planning necessary preventive, interceptive measures and helps in early correction of the malocclusion, thus reducing its severity in the permanent dentition, therefore, creating awareness among people raising concern for dental appearance.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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